MISCELLANEA ZOOLOGICA HUNGARICA

Tomus 3. 1985 p. 91-101

Ecological studies on zooplankton species important for fish farms. I. Population biological investigations on zooplankton breeds

By

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(Received 9 May, 1985)

ABSTRACT. The population dynamics of the zooplankton species common in fish-ponds in Hungary, Brachionus calyciflorus (Pallas), Asplanchna priodonta (Gosse), A. brightwelli (Gosse), Moina brachiata (Jurine) and Daphnia magna (Straus), was examined. Under less favourable temperature and nourishment conditions the populations of the various zooplankton species occur with decreasing density, and the gradation peak was observed some days later. The population biological parameters necessary for the selective plankton preparation technology set up at the Tempered Watered Fish-breeding Farm of Százhalombatta have been established.

INTRODUCTION

In the pre-raising of bred fish the prime task is to grant natural nourishment sufficient both in size and quantity in the starting period, because the complex nutriment substituting the natural one has been worked out only for a few species of fish so far.

Information concerning their reproduction under laboratory and natural condition can be obtained from several articles (LAMPERT, 1978; JACOBS, 1977; EDMONSON, 1960; GILBERT, 1970; HALBACH, 1978).

In the technical literature, for instance, the works by KOZSINA (1971) and MILSTEIN (1972) give good surveys on the methods of plankton-breeding in fisheries. Further details in connnection with the topic can be found in the work by KISS (1982).

The aim of our investigations was to establish the time and causes of the maximum number of individuals of the populations of certain zooplankton species by way of tracing the structural elements of the populations in the case of the technology used on the Tempered Watered Fish-breeding Farm of Százhalombatta. By knowing these data, the optimal time of the introduction of fish into the ponds can be established, and so can the time of introduction of the zooplankton basic population to provide further constant natural nourishment. (TAMÁS and HORVÁTH, 1972; TAMÁS and KISS, 1975).

MATERIALS AND METHODS

We bred cultures of the Rotatoria (Brachionus calyciflorus Pallas, Asplanchna brightwelli Gosse, Asplanchna priodonta (Gosse), and the Cladocera (Moina brachiata (Jurine) and Daphnia magna (Straus), which form the nourishment basis of the fry.

The experiments were carried out on the Tempered Watered Fish-Breeding Farm of Százhalombatta in 1975. So as to provide approximately identical ecological conditions, the technology used during the preparation of the 100 m^2 experimental ponds was the same as on the farm (TÖLG ed. 1981) the only difference being that no fish were introduced. After the draining of the ponds, their soil was evenly dusted with burnt lime powder so as to disinfect

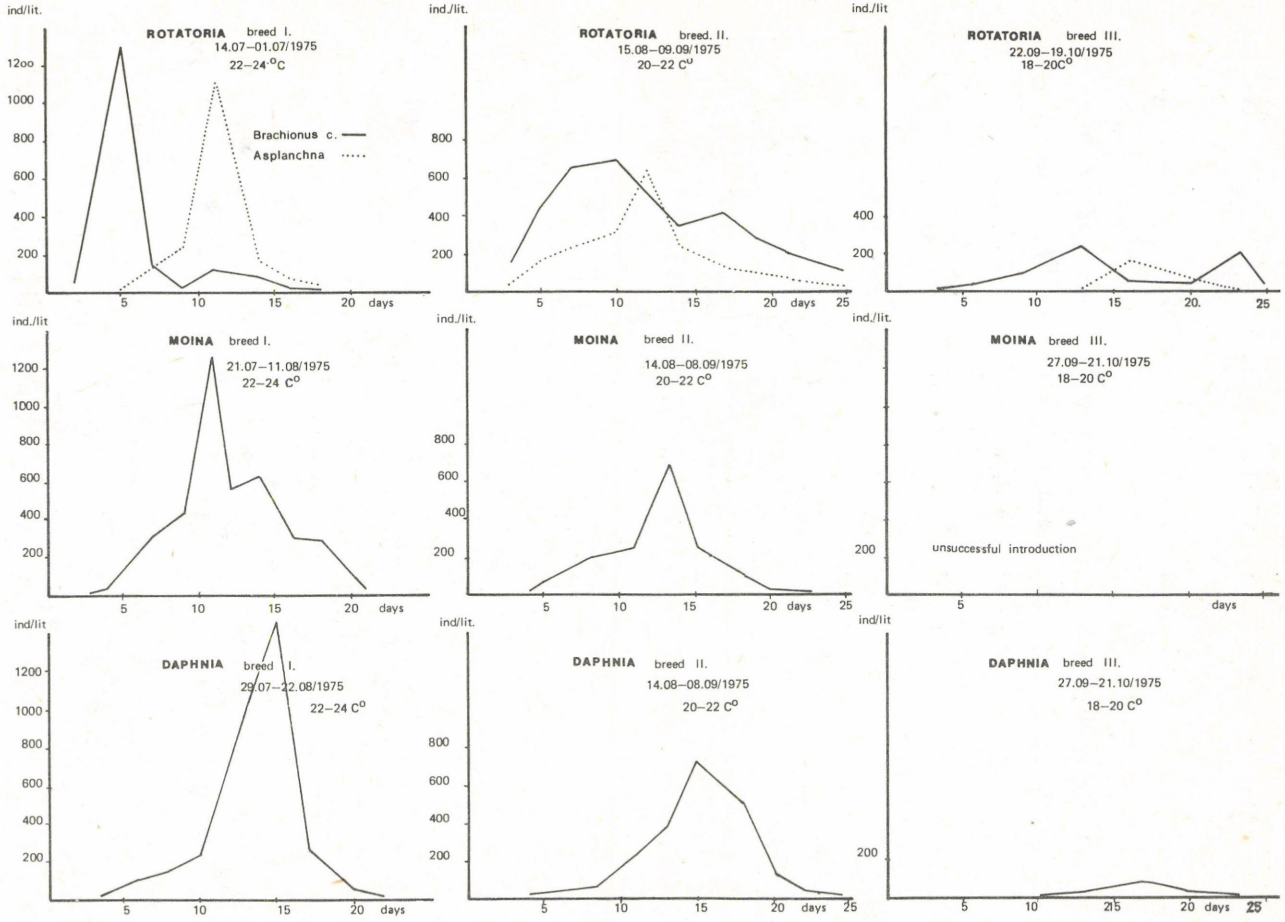

Fig. 1. The change of the density values of the zooplankton stocks in the breeds set up at different times

the soil of the ponds. After this, simultaneously with the slow flooding, 200 kg of pig manure, 3 kg of urea and 1.5 kg of phosphorous fertilizer were added to the water of each pond. To sift out the Cladocera spp. and wild fishes, the water was let in through a plastic sieve. When 0.8 m deep, the water of the ponds was treated with 1 ppm concentration of insecticide "Flibol-E" with trichlorfon as the agent so as to guarantee the selective preparation for rotifers. This substance destroys the planktonic Crustacea species, so only the Rotatoria spp. remain alive and form a basic stock in the water of the pond (TAMÁS and HORVÁTH, 1972, 1974, 1975). Since the effect of "Flibol-E", lasting for five to six days, destroys planktonic Crustacea, it was only afterwards that the basic populations of Moina brachiata and Daphnia magna were introduced in the Cladocera breeds. 1000 mature female individuals with eggs were introduced into each pond on the 6th day after their filling up in the case of the Moina I, II, III and the Daphnia II, III breeds; and on the 9th day in the case of the Daphnia I. breed.

When sampling on every 3rd day as an average, 20 litres of water were ladled with a one-liter graduate from ten given places of each pond. The sample filtered through the plankton-sieve was fixed and stored in 4% concentration of formalin until processing.

During the time of experiment there were no further nutriment addition and biomass drawing.

For the separation of the species, we used the books available on this topic (GULYÁS, 1974; VARGA, 1966; VOIGHT, 1956).

In the present article the results of the following experimental ponds were used. The starting points indicate the flooding of the ponds in the case of the Rotatoria breeds, and the introduction of the starting population in the case of the Cladocera breeds.

Rotatoria breeds:

I.	14.07.1975 - 01.08.1975	(8 samplings during 18 days)
II.	15.08.1975 - 09.09.1975	(10 samplings during 25 days)
III.	22.09.1975 - 19.10.1975	(8 samplings during 27 days)

Moina breeds:

I.	21.07.1975 - 11.08.1975	(10 samplings during 21 days)
II.	14.08.1975 - 08.09.1975	(10 samplings during 25 days)
III.	27.09.1975 - 21.10.1975	(8 samplings during 25 days)

Daphnia breeds:

I.	29.07.1975 - 22.08.1975	(10 samplings during 24 days)
II.	14.08.1975 - 08.09.1975	(10 samplings during 25 days)
III.	27.09.1975 - 21.10.1975	(8 samplings during 25 days)

Since the basis of population-dynamic investigation of a given species is the establishment of the population structure, we made regular surveys.

The fact that in the examined population of the Rotatoria and Cladocera species the individual generations overlap each other, renders the analysis of the ability for reproduction of the population very difficult.

From among the structural elements of the Brachionus calyciflorus populations (Tables 1 and 2) the separation of age-groups was possible only to the extent that the young, smaller individuals not producing eggs were separated from the adult individuals. Taking into consideration their way of reproduction, we separated the amictic individuals, those producing eggs without fecundation from the mictic individuals and the ephippial females.

In the tables presenting the structure of the populations of the two Cladocera species (Tables 3 to 6) there were more opportunities for the separation on the ground of age and sex as a result of the endowments of the species. Thus, into the group of the reproductive females we listed individuals nursing eggs well visibly in their ovary from the more developed ones with eggs in their brood pouch. We separately counted the females which grew old and were no longer able to produce eggs. Into the group of the young or juvenile we listed the smaller individuals in the ovary of which developing eggs could not be recognized. The males, which are rare and differ from the females both in the form and the size of the body were also separated, as were the females bearing resting eggs and representing ephippium.

We counted the eggs released from the brood pouch of the females with eggs; we compared the proportion of the reproductive females and young individuals to the total number of individuals.

In the tables we indicated the above-mentioned data according to the dates of the individual times of sampling, and to the number of days after the introduction of the basic population.

In the 3rd breeds of the Rotatoria and Cladocera species, under unfavourable temperature and nourishment conditions, we found so small number of individuals that we could not even use them for the population structure investigations. So the change in the number of individuals is indicated only in Table 1.

In the case of each breed, the growth of population, until it reached the maximum number of individuals, was compared using the method of linear regression analysis (Figs 2 and 3). We supposed that, at the starting period, the population growth can be described by sigmoid curve. We expressed the indicated data in logarythm values on both axes, and on the basis of the equation $y = ax+b$, we made the linear adjustment.

RESULTS AND DISCUSSION

A) Rotatoria breed

I recorded the changes observed in the first experimental pond in Table 1 and Figure 1. In this breed, in the period from 14.07 to 01.08, the average water temperature was between 22 and 24°C, which was very favourable for the Rotatoria.

In the period following the flooding and the addition of chemicals, in the zooplankton stock of the pond, Brachionus calyciflorus was overwhelming, whereas, later, the multiplication of the predator Asplanchna species followed. The Brachionus gradation reached its maximum on the 5th day following the flooding of the pond, then the value was 1352.8 individuals/ litre. After this, as a result of the relative shortage of nourishment and the growing Asplanchna population, their number decreased rapidly, and on the 18th day I found hardly any surviving individuals. The Asplanchna stock reached the maximum number of individuals (1122.8 ind./ lit.) on the 11th day. Parallel with the Rotatoria stock's growing old in the pond, there appeared the nourishment-rival Copepoda and Cladocera species.

With the Brachionus calyciflorus, the average number of eggs was 2.0 during the time of investigation, even at the time of intensive reproduction. This can be explained by the following: the species react to the favourable environmental conditions not with increasing the number of eggs but with the acceleration of the rhythm of the production and ovulation of eggs. The time span between the oviposition cycles is very short: from 18 to 22 hours if the temperature is 21 to 24°C. If the environment is rich in nourishment, the reproduction of the Rotatoria is more intensive, but their life-span also becomes shorter, they live for 4 to 7 days only (VARGA, 1966).

The juvenile, individuals not producing eggs comprise 50 % of the Brachionus population at the time of the maximum number of individuals. It can also be observed that there are mictic females already in the booming period of the population, but their number is the biggest at the time of the maximum number of individuals of the population and immediately after it, as if forecasting the rapid decrease in number, well shown by the appearance of the ephippial females.

Afterwards we experienced one more much smaller maximum of population, the appearence of which can be contributed to the remultiplication of some surviving female individuals. The arising relative plentitude of nourishment originates from the organic-material recuperative processes of the so-called "plankton-fall" consisting of dead individuals (SEBESTYÉN, 1963). The rapid multiplication, the big starting number of the individuals of the Brachionus population provided good opportunity for the upswing of the populations of the Asplanchna species. The most frequent species are: Asplanchna priodonta Gosse, Asplanchna brightwelli Gosse. The sudden collapse of the Brachionus population, however, was followed by the decline of the Asplanchna populations consuming it.

In the second experimental pond (Rotatoria breed II, Table 2, Fig. 1) in the period from 15.08 to 09.09, the average water temperature was between 20 to 22°C, which can be considered more unfavourable in comparison with the conditions of the first breed. Here the Brachionus population reached its maximum (736.0 ind./lit.) only on the 10th day, which shows significant decrease in the number of individuals and time shift in comparison with the results of the previous breed (Table 2, Fig. 1). The breed lived on for a longer period of time (25 days), and the two species co-existed for a longer period, too.

Table 1. Some population biological parameters of the Brachionus calyciflorus-I breed; and the change of the number of the Asplanchna species

Date of sampling	Number of days after flooding	Brachionus calyciflorus								Asplanchna
		total number of individuals ind./lit.	juveniles without eggs ind./lit.	juveniles/the total number of individuals %	amictic females ind./lit.	amictic fem./ total number of individuals %	number of juveniles/one female	mictic females ind./lit.	ephippial females ind./lit.	total number of individuals
16.07	2	52.4	18.9	36.3	32.3	61.6	0.59	1.2	0.0	0.0
19.07	5	1352.8	725.2	53.6	606.7	44.8	1.19	20.9	0.0	0.0
21.07	7	166.7	153.0	91.6	11.6	6.9	13.2	0.0	2.1	114.2
23.07	9	3.0	3.0	100.0	0.0	0.0	-	0.0	0.0	211.1
25.07	11	143.1	48.8	34.1	88.2	61.6	0.55	6.1	0.0	1122.8
28.07	14	85.0	15.4	18.1	69.4	81.6	0.2	0.0	0.0	172.4
30.07	16	4.3	3.1	72.0	1.2	27.9	2.6	0.0	0.0	58.0
01.08	18	1.0	0.0	0.0	1.0	100.0	0.0	0.0	0.0	6.0

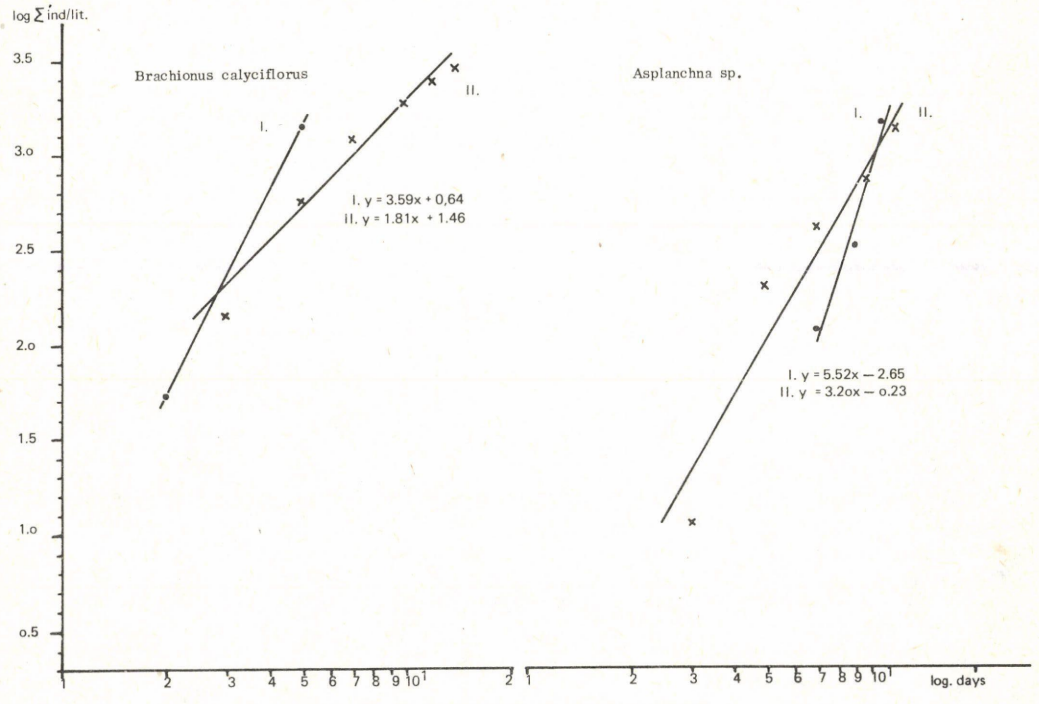

Fig. 2. The regression analysis of the increase of the density values of the Rotatoria stocks

Table 2. Some population biological parameters of the Brachionus calyciflorus-II breed; and the change of the number of the Asplanchna species

Date of sampling	Number of days after flooding	Brachionus calyciflorus								Asplanchna
		total number of individuals ind./lit.	juveniles without eggs ind./lit.	juveniles/the total number of individuals %	amictic females ind./lit.	amictic fem./ total number of individuals %	number of juveniles/one female	mictic females ind./lit.	ephippial females ind./lit.	Total number of individuals
18.08	3	173.0	132.2	76.4	40.8	23.5	3.2	0.0	0.0	12.2
20.08	5	408.2	286.0	70.0	121.9	29.8	2.3	0.3	0.0	186.0
22.08	7	651.4	314.3	48.2	322.7	49.5	1.0	12.0	2.4	212.2
25.08	10	736.0	377.5	51.2	328.1	44.6	1.2	8.4	22.0	319.8
27.08	12	503.1	313.6	62.3	169.0	33.6	1.9	2.1	18.4	617.6
29.08	14	357.2	274.8	76.9	76.3	21.5	3.6	0.0	6.1	250.4
01.09	17	417.3	310.9	74.6	101.4	24.3	3.1	0.0	5.0	120.1
03.09	19	307.8	291.6	94.7	16.2	5.3	18.0	0.0	0.0	74.9
05.09	21	221.3	119.0	53.8	2.3	1.0	51.7	0.0	0.0	82.3
09.09	25	119.9	0.0	-	3.9	3.3	-	0.0	0.0	65.0

Table 3. Some population biological parameters of the Moina brachiata-I breed

Date of sampling	Number of days after introduction	Total number of individuals ind./lit.	Grown-up amictic females ind./lit.	Reproductive females ind./lit.	Repr. females/total number of amictic females %	Average number of eggs	Adults, no longer producing eggs ind./lit.	Juveniles ind./lit.	Juveniles/total number of individuals %	Juveniles/one reproductive females	Males ind./lit.	Ephippial females ind./lit.
24.07	3	2.3	1.1	1.1	100.0	10.3	0.0	1.2	52.2	1.1	0.0	0.0
25.07	4	44.3	24.0	23.2	96.6	17.8	0.8	20.3	45.8	0.9	0.0	0.0
28.07	7	300.2	156.8	152.3	97.1	13.5	4.5	143.4	47.8	0.9	0.0	0.0
30.07	9	405.1	156.3	156.3	100.0	14.0	0.0	248.8	61.4	1.6	0.0	0.0
01.08	11	1255.1	460.0	455.0	98.9	8.6	5.0	782.5	62.4	1.7	7.4	5.2
02.08	12	551.4	105.1	83.8	79.8	10.9	21.3	200.0	36.3	2.4	182.5	63.8
04.08	14	631.4	305.1	261.3	85.6	5.9	43.8	136.2	21.6	0.5	25.1	165.0
06.08	16	290.2	124.0	110.1	88.8	4.6	13.8	83.8	28.9	0.8	0.0	82.5
08.08	18	285.0	150.0	142.5	95.0	7.0	7.5	120.0	42.1	0.8	0.0	15.0
11.08	21	67.5	27.5	100.0	8.1	0.0	37.5	37.5	55.5	1.4	0.0	2.5

Table 4. Some population biological parameters of the Moina brachiata-II breed

Date of sampling	Number of days after introduction	Total number of individuals ind./lit.	Grown-up amictic females ind./lit.	Reproductive females ind./lit.	Repr. females/total number of amictic females %	Average number of eggs	Adults, no longer producing eggs ind./lit.	Juveniles ind./lit.	Juveniles/total number of individuals %	Juveniles/one reproductive females	Males ind./lit.	Ephippial females ind./lit.
18.08	4	15.3	7.0	7.0	100.0	-	0.0	8.3	54.2	1.2	0.0	0.0
20.08	6	73.3	28.2	28.2	100.0	13.4	0.0	45.1	61.5	1.6	0.0	0.0
22.08	8	186.6	81.9	81.9	100.0	15.1	0.0	104.7	56.1	1.3	0.0	0.0
25.08	11	283.4	112.8	112.8	100.0	6.3	0.0	157.4	55.5	1.4	13.2	0.0
27.08	13	720.0	292.5	277.6	94.8	6.1	14.9	359.7	49.9	1.3	26.2	41.6
29.08	15	253.0	103.8	71.8	69.0	5.0	32.0	93.3	36.9	1.3	0.0	38.1
01.09	18	95.8	54.2	46.0	85.2	2.1	8.2	24.6	25.6	0.5	0.0	17.0
03.09	20	28.0	11.8	6.1	51.6	2.0	5.7	13.4	47.9	2.2	0.0	2.8
05.09	22	39.1	28.9	17.3	59.8	-	11.6	8.2	20.9	0.5	0.0	2.0
08.09	25	6.3	3.2	2.2	68.7	-	1.0	3.1	49.2	1.4	0.0	-

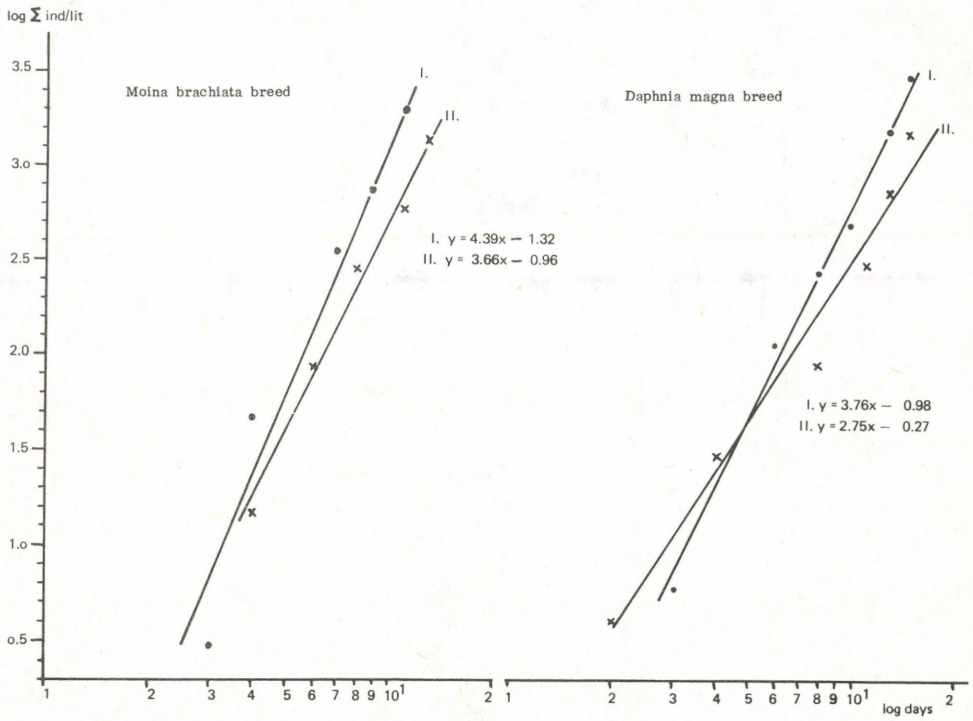

Fig. 3. The regression analysis of the increase of the density values of the Cladocera stocks

Table 5. Some population biological parameters of the Daphnia-I breed

Date of sampling	Number of days after introduction	Total number of individuals ind./lit.	Grown-up amictic females ind./lit.	Reproductive females ind./lit.	Repr. females/total number of amictic females %	Average number of eggs	Adults, no longer producing eggs ind./lit.	Juveniles ind./lit.	Juveniles/total number of individuals %	Juveniles/one reproductive females	Males ind./lit.	Ephippial females ind./lit.
01.07	3	6.4	2.4	2.4	100.0	30.1	0.0	4.0	62.5	1.66	0.0	0.0
04.07	6	104.7	16.1	15.4	95.6	30.5	0.7	88.6	84.6	5.8	0.0	0.0
06.07	8	149.7	40.6	40.6	100.0	19.3	0.0	109.1	73.2	2.7	0.0	0.0
08.07	10	220.5	48.0	47.4	98.7	14.1	0.6	172.5	78.2	3.6	0.0	0.0
11.07	13	1056.2	115.8	54.3	46.8	8.6	61.5	915.2	86.6	16.9	11.2	14.0
13.07	15	1502.9	158.1	1.0	0.6	1.0	157.1	1280.3	85.1	1280.3	45.7	18.8
15.07	17	259.2	39.3	0.0	-	0.0	39.3	194.7	75.1	-	25.2	0.0
18.07	20	63.4	17.0	0.0	-	0.0	17.0	46.4	73.2	-	0.0	0.0
20.07	22	9.2	4.0	0.0	-	0.0	4.0	5.2	56.5	-	0.0	0.0
22.07	24	3.4	2.3	0.0	-	0.0	2.3	1.1	32.3	-	0.0	0.0

Table 6. Some population biological parameters of the Daphnia magna-II breed

Date of sampling	Number of days after introduction	Total number of individuals ind./lit.	Grown-up amictic females ind./lit.	Reproductive females ind./lit.	Repr. females/total number of amictic females, %	Average number of eggs	Adults, no longer producing eggs ind./lit.	Juveniles ind./lit.	Juveniles/total number of individuals %	Juveniles/one reproductive females	Males ind./lit.	Ephippial females ind./lit.
16.08	2	4.1	2.0	2.0	100.0	12.1	0.0	2.1	51.2	1.1	0.0	0.0
18.08	4	25.9	10.1	10.1	100.0	16.3	0.0	15.8	61.0	1.6	0.0	0.0
22.08	8	58.3	18.0	18.0	100.0	22.7	0.0	40.3	69.1	2.2	0.0	0.0
23.08	11	215.8	36.2	36.2	100.0	25.4	0.0	179.6	83.2	5.0	0.0	0.0
27.08	13	403.1	70.7	68.3	96.6	20.0	2.4	326.1	80.8	4.8	6.3	0.0
29.08	15	763.2	179.8	154.6	86.0	16.8	25.2	532.3	69.7	3.4	18.0	33.1
01.09	18	500.9	151.1	135.4	89.6	7.6	15.7	318.7	63.7	2.4	8.8	22.3
03.09	20	175.5	53.8	31.0	57.6	3.0	22.8	101.0	57.4	3.3	2.1	18.6
05.09	22	51.9	15.3	8.2	53.6	2.3	7.1	31.6	60.9	3.9	0.0	5.0
08.09	25	17.8	6.1	1.9	31.1	-	4.2	9.0	50.5	4.7	0.0	2.7

In the third experimental pond (Rotatoria breed III), from 22.09 to 19.10 the average water temperature was between 18 and 20°C. Considering that in this breed the maximum abundance values did not exceed 200 ind./lit., we do not go into details, we recorded it only among the diagrams of comparison (Fig. 1).

B) Moina brachiata breed

The results of the breed in the first experimental pond are shown in Table 3 and Figure 1. In the period between 21.07 and 11.08 the water temperature varied from 22 to 24°C, which was fairly favourable for the Moina population.

The maximum abundance of the Moina population occurred on the 11th day after the introduction. 1255.1 individuals were found in one litre of water in this case. In the period of intensive reproduction the stock was able to double its total number daily. We found the biggest average number of eggs on the 4th day, it was 18 eggs/female, which gradually decreased as the population grew old. During the time of breeding it was in the starting period that we found the maximum number of eggs in one female, which was 26 eggs.

The ageing of the population occurred during the 4th week of the experiment. At the end of the 3rd week, Daphnia magna and Cyclops species appeared with an increasing abundance. The appearance and multiplication extraneous species indicate the severe deterioration of the pure breed, and also the unfavourable change of environmental conditions.

In the intensive period of reproduction as far as reaching the maximum number of individuals, the population was made up of females with eggs and young individuals with eggs and young individuals producing eggs only later. However, on reaching the peak of gradation, there appeared more and more females no longer producing eggs and also males, and ephippial females. The maximum number of male individuals occurred 2 days before and with a higher value than that of the ephippial females.

In the breed Moina II from 14.08 to 08.09 the water temperature was lower (20 to 22°C), thus, the maximum abundance was also lower (720.0 ind./lit.), and the time of appearance was shifted, too (Table 4 and Fig. 1).

The formation of the breed Moina III. after the introduction of the basic population was unsuccessful because of the marked decrease in water-temperature and alga-production (Fig. 1).

C) Daphnia magna breed

We indicated the changes taking place in the first experimental pond in Table 5 and Fig. 1. During the breed, the water-temperature was generally between 22 and 24°C (from 29.07 to 22.08).

The maximum abundance of Daphnia magna occurred on the 15th day after the introduction, when 1502.9 ind./lit. were found. During the breed it was in the starting period that we found the maximum number of eggs in one female, which was 52. The biggest average number of eggs was found on the 6th day with the value of 30.5 eggs per individual, and which decreased to 0 on the 17th day. From the average values for the egg-number one can see that at this time the population was strongly deteriorating from the point of view of population reproduction.

In the starting period, then, in the period of intensive reproduction, in the breakdown of the population by age, the highest percentage is represented by the juvenile individuals. The exterior features also prove that the conditions were good. The transient, oily colour of the gut contents and the wall of the intestines, and the numerous small dark oily coloured eggs testify optimal conditions (KONOVALOV, 1955). Even in the case of maximum reproduction, the brood pouch of some percent of the adult individuals is empty in the stock. This observation is precisely supported by the experiments by WOYNÁROVICH (1958). The males and the ephippial females appear before the population reaches complete maturity, their maximum abundance coincides with the gradation value of the population. Here, too, the number of the male individuals is much bigger than that of the fecundable females.

In the second breed (Table 6, Fig. 1) set up at a later time (from 14.08 to 08.09) under less favourable nourishment and temperature conditions, we experienced the decrease of the abundance and also that the maximum value occurred later.

In breed Daphnia III (from 27.09 to 21.10) with the water being 18 to 20°C, the population was unable to multiply in a large number, the number of individuals was under 100 ind./lit. all the time, so its results are shown only in Figure 1.

D) The linear regression analysis of the growth of the populations

The regression analysis of the growth of density of the individual zooplankton populations led to the results shown in Tables 2 and 3.

In the case of the two breeds of all the four species, the reliability of linear adjustment was of high degree (significant at the level of p: 0.1 or 1.0 %).

Considering that the values of "a" are proportionate to the growth of the density values of the stock, they express the relative degree of growth. We calculated species by species, how the speed of growth with the second breed changed under less favourable temperature and nourishment conditions in comparison with the first breed. The calculation was made with the following formula: m = "a" breed II/"a" breed I. If the value of "a" is low, it means that the growth of the density value reacted sensitively to the changed environmental conditions. The nearer its value is to 1.0 the smaller is the arising influence.

In comparison with the first breeds, in the second breeds the value "a" of the regression line was less in each case. This change was the following in degree:

species	"m"
Brachionus calyciflorus	0.50
Asplanchna spp.	0.58
Moina brachiata	0.83
Daphnia magna	0.73

The decrease is the most marked with the two Rotatoria species. The degree of the decrease is smaller in the case of the predator Asplanchna spp. (42%) than that of the prey animal (50 %).

So as to clarify this observation from a different aspect, we examined how big the growth of the predators' stock was, and what was its proportion to the speed of the density growth of the prey animal. The calculation was made with the following formula:

n = "a" Asplanchna / "a" Brachionus

Its value was 1.54 in the first breeding series, and 1.77 in the second one. It means that the growth of the density value with the predator Asplanchna stock is bigger than that of the prey animal. Under less favourable environmental conditions, the proportion of the speeds of growth remained similar.

SUMMARY

Summing up the results of the three breeding series, we can state that in the mid-summer period (breeds I), in well-warming waters, with ample alga-production, the filter-feeder zooplankton organisms reach an outstanding number of individuals rapidly. After a boom-like reproduction, the decline of the population follows fast, too. In the late-summer and early-autumn period (breeds II, III), the water-temperature and light conditions change, also there is a decrease of the phytoplankton in quantity as a result of which the zooplankton populations also occur with a smaller number of individuals, the time of the gradation peak is shifted some days, and the breeds live on for a longer time.

There is a close connection between the parthenogenetic egg-number and the consumed nourishment quantity of the zooplankton species with alga-filtering activity. From the number of the eggs (embryos) found in the brood pouch of individuals in fishpond samples we could conclude back to the amplitude or insufficiency of the nourishment available in the habitat. One should remember, however, that these data reflect the situation of the state of nourishment supply at the period of the production of eggs. Comparing the maximum number of eggs which can be experimentally established to the number of eggs actually found, the degree of deviation can serve as an indicator of the production opportunities of the fishpond.

The population-biological investigations of the individual zooplankton species supported the selective plankton preparation method used on the Tempered Watered Fish-breeding Farm of Százhalombatta, with the help of which natural nourishment adequate both in size and quantity can be granted for the developing fish progeny. In the progeny breeding ponds zooplankton breeds following each other in time can be brought about.

ACKNOWLEDGEMENTS

I would like to express my thanks to István TÖLG, László HORVÁTH and Gizella TAMÁS for providing an opportunity for me to make investigations on the Tempered Watered Fish-breeding Farm of Százhalombatta. Thanks for their valuable professional help during the experiments, too.

My special thanks to my colleague Gábor BAKONYI for his generous help and constant support during the evaluation of the results.

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